

Composite Primer

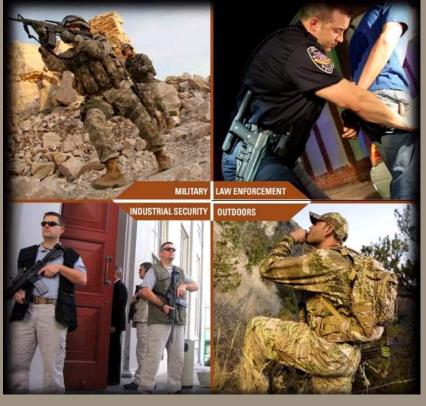
Next Generation Primer Technology

Joel Sandstrom Chemist, ATK Sporting Group May 2012



ATK Sporting Group











A growing portfolio of market-leading brands

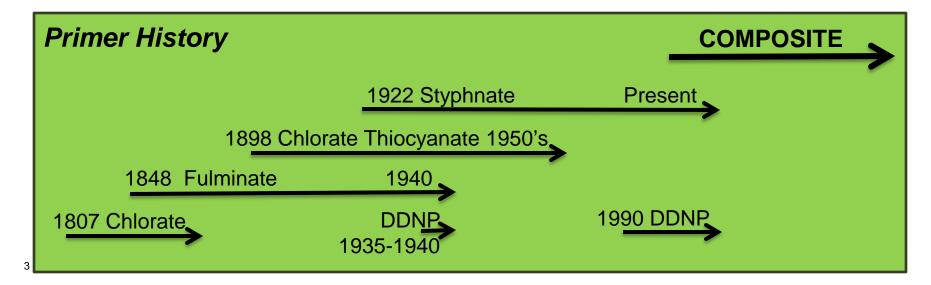
- Headquartered in Anoka, Minnesota
- Sporting and hunting ammunition
- Law enforcement and security forces ammunition
- Propellant for reloaders and ammunition
- Shooting sport accessories
- Tactical systems and accessories for:
 - Military customers
 - Law enforcement and security markets
 - Consumer markets

Background



Primer Fundamental Requirements

- Safety manufacturing and consumer
- Sensitivity impact and friction, tunable
- Ignition transfer of calories in the form of sustained heat
- Reliability 6+ sigma
- Stability moisture, temperature, aging
- Brisance minimum overpressure necessary
- Toxicity environmental (RCRA), human (OSHA)
- Cost widget



Design Approach



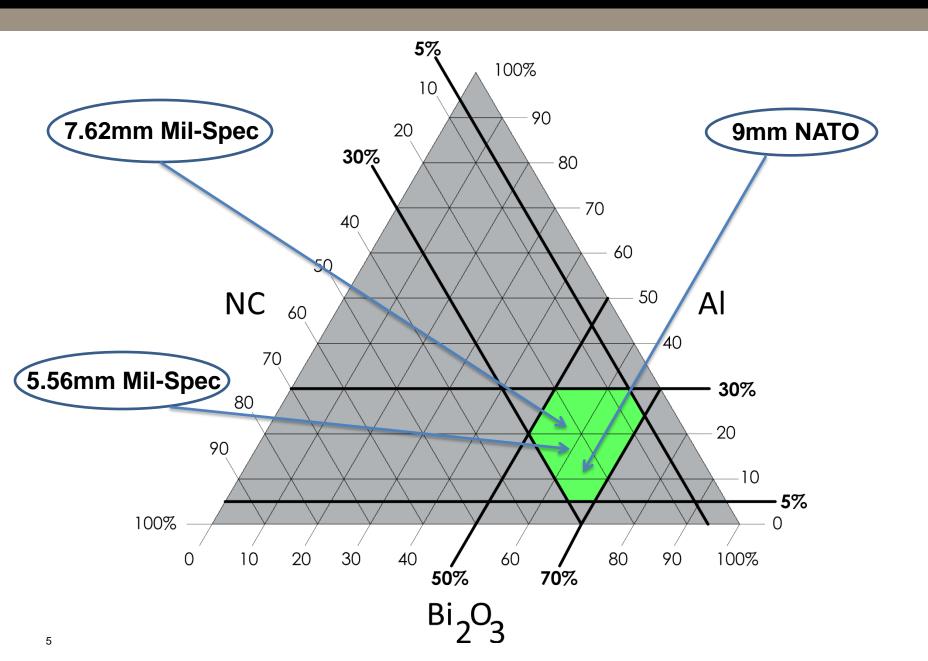
ATK Composite Pyrotechnic System

Theory: Sensitivity to detonation for many explosives increases in the presence of a reducing agent

- The Composite pyrotechnic system creates maximum surface area contact between explosive and reducing agent
- 2. The system generates significant and sustained heat to allow complete utilization of relatively inactive oxidizers

Composite Primer Design Space Example





Composite Primer Assembly Example





Standard Primer Cup

Pyrotechnic







Standard Boxer Anvil

Conventional Water Based Primer Manufacturing

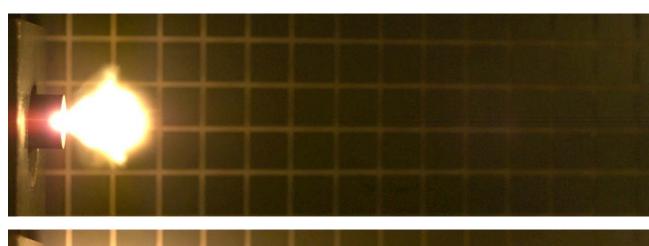


ATK COMPOSITE PRIMER

Ignition Progression



5.56mm Primed Brass



Composite No. 41

U.S. Mil

No. 41



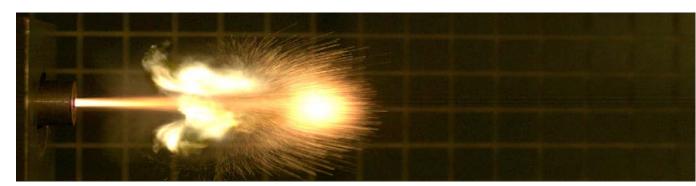
Time 850 - 1650 microseconds

Comparison at 1250 Microseconds

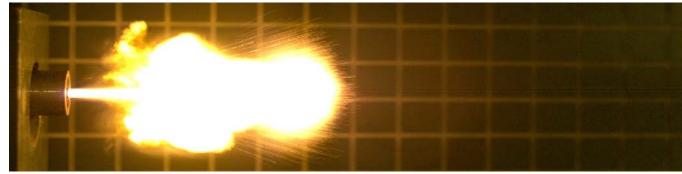


5.56mm Primed Brass

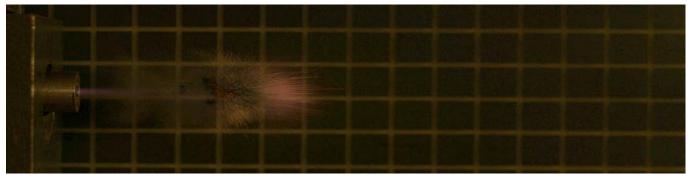
Mil-Spec No. 41



Composite No. 41

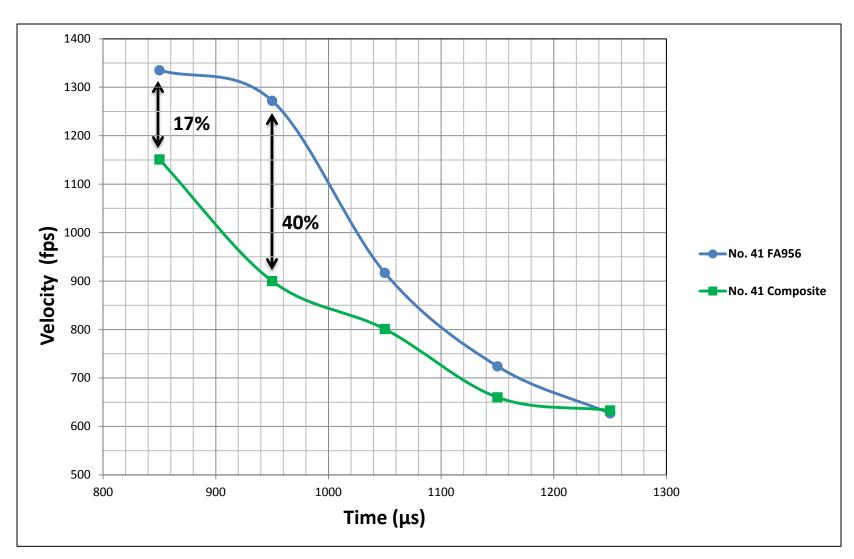


DDNP No. 41



5.56mm - Flame Front Velocity





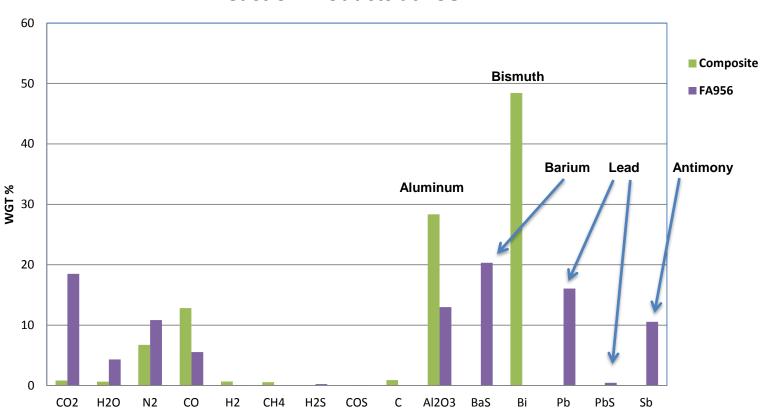
Data Calculated using High Speed Video from Case Mouth



Condensed Phase Exhaust Products

Fraunhofer Thermodynamic ICT Code

Reaction Products at 298°K



Ballistic Examples



2009 Data

Example – 1 5.56mm, M193, 10 rounds

<u>Chamber Pressure / Std Dev</u> <u>Velocity / Std Dev</u>

Control 52,944 / 1155 3134 / 14 Composite 52,201 / 1072 3141 / 17

Example – 2 7.62mm, M80, 10 rounds

Chamber Pressure / Std Dev Velocity / Std Dev

Control 50,151 / 1330 2728 / 13 Composite 54,149 / 749 2792 / 8

Example – 3 9mm NATO, M882, 10 rounds

Chamber Pressure / Std Dev Velocity / Std Dev 24,699 / 650 1217 / 10

 Control
 24,699 / 650
 1217 / 10

 Composite
 25,491 / 804
 1214 / 3

Conclusion



Design meets the Product System Requirements

Production Status

- Independent 25,000 round production runs passed 5.56mm full Mil-Spec LAT's
- Multiple field tests complete / Standard production runs in field evaluation

Safety: Significantly increased safety margin gained by elimination of

manufacture and handling trinitroresorcinol and lead styphnate

Manufacture: Water processed consistent with lead styphnate primer mixing

• Configuration: Boxer Style cup / anvil consistent with Mil-Spec primers

• Cost: Very Competitive with current manufacturing cost

• Source: Primarily U.S. components; potential for 100% U.S.

Patent: Multiple patents pending

Questions



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